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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/802,468	03/09/2001	Kenneth J. Ruchala	066744-0012	5869

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EXAMINER

DASTOURI, MEHRDAD

ART UNIT	PAPER NUMBER
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2623

DATE MAILED: 04/07/2004

14

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/802,468

Applicant(s)

RUCHALA ET AL.

Examiner

Mehrdad Dastouri

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 12 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-19 is/are rejected.
- 7) ☒ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Response to Amendment*

1. Applicants' amendment filed on January 12, 2004, has been entered and made of record.
2. Applicant's arguments regarding Claims 1 and 2 have been fully considered but they are not persuasive. Claim language does not recite reconstructing incomplete data, or imperfect data. Neither the claimed invention recites incorporating additional data or creating a new sinogram with missing regions filled-in by intelligently estimating them from a separate data set.

It is further submitted that claim language does not recite second input image, and "two separate images as inputs". Claim language simply recites, "aligning the first image to a second image to obtain an aligned image, so that optimal registration between the first and second image is obtained" which is clearly disclosed by the prior art of record (Arata) as indicated in the detailed rejection of Claims. Arata discloses working with two images at a time in its process of registration. Applicants' further arguments are based on the assumed deficiency discussed above, and consequently are not persuasive.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 14-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In Lines 6 of Claim 14, "the second sinogram data set" lacks antecedent basis.

Claims 15-18 depend on Claim 14.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-3, 5, 9-11, 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Arata (U.S. 5,552,605).

Regarding Claim 1, Arata discloses a method of augmenting a tomographic projecting image of a patient, the method comprising:

obtaining a first sinogram data set (Projection data either transmission or emission, Column 3, Lines 39-41);

reconstructing the first sinogram data set into a first image (Projecting views, Column 3, Lines 39-42; Column 4, Lines 21-23);

aligning the first image to a second image to obtain an aligned image, so that optimal registration between the first and second image is obtained (Column 3, Lines 61-66; Column 4, Lines 7-11 and 22-25);

reprojecting the aligned image into a reprojected sinogram data set (Column 4, Lines 32-34);

extracting data from the reprojected data set that is not available in the first sinogram data set (Column 4, Lines 34-38, deviations are the extracted data);

augmenting the first sinogram data set with the extracted data from the reprojected sinogram data set to obtain an augmented sinogram data set (Column 4, Lines 37-47); and

reconstructing the augmented sinogram data set into a third image (Column 4, Lines 41-55).

Regarding Claim 2, it recites substantially the same limitations as Claim 1 above and analogous remarks apply. For the limited data feature Arata discloses:

converting limited data (Column 2, Lines 23-25; Column 3, Lines 58-67, Column 4, Lines 1-19).

Regarding Claim 3, Arata further discloses the method according to Claim 2 wherein the step of fusing comprises

the steps of extracting certain features from the limited image and the complete image and registering the features into the transformed complete image (Column 2, Lines 23-25; Column 3, Lines 58-67, Column 4, Lines 1-19. ).

Regarding Claim 5, Arata further discloses the method according to Claim 2 wherein the step of fusing is performed automatically (Column 4, Lines 36-41).

Regarding Claim 9, Arata further discloses the method according to Claim 2 further comprising the steps of using the image converted from the limited data sinogram for one of the following: patient setup (Figure 1; Column 2, Lines 59-67,

Column 3, Lines 1-28), dose registration, delivery verification, deformable patient registration, and deformable dose registration.

Regarding Claim 10, Arata further discloses the method according to Claim 1 wherein the step of aligning comprises the steps of extracting certain features from the first image and the second image and registering the features (Column 4, Lines 36-39. Translators adjust for cumulative offset.).

Regarding Claims 11 and 13, arguments analogous to those presented for Claim 9 applies to Claims 11 and 13.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 4, 6 and 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arata (U.S. 5,552,605) in view of Hibbard et al (U.S. 6,266,453).

Regarding Claim 4, Arata does not teach the method according to Claim 2 wherein the step of fusing is performed manually.

Hibbard teaches automated image fusion/alignment system wherein the fusing is performed manually (Column 5, Lines 50-53).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the manual fusing technique taught by Hibbard in the system of Arata to focus only on those regions of genuine interest in the image data.

Regarding Claim 6, Arata does not teach the method according to Claim 2 wherein the step of fusing is performed using geometric features, gradient methods or voxel-similarity techniques.

Hibbard teaches:

wherein the step of fusing is performed using geometric features (Column 11, Lines 36-40, and 50-65) or voxel-similarity techniques (Column 6, Lines 48-52; Column 11, Lines 4-9).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use geometric features taught by Hibbard in the fusing system of Arata because it is a simplified feature extraction that will expedite fusing process.

Regarding Claims 14 and 19, arguments analogous to those presented for Claim 1 applies to Claim 12. Hibbard et al further disclose utilizing first and second sinogram from a patient (Abstract).

Regarding Claim 15, Arata further discloses the method according to Claim 14 wherein the first sinogram data set contains limited data (Column 2, Lines 23-25; Column 3, Lines 65-66).

Regarding Claim 16, Arata further discloses the method according to Claim 14 wherein the second sinogram data set contains complete data (Second set of reprojection views, Column 4, Lines 33-35).

Regarding Claims 17 and 18, arguments analogous to those presented for Claims 1 and 2 applies to Claims 17 and 18.

9. Claims 7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arata (U.S. 5,552,605) in view of Basu et al (U.S. 6,282,257).

Regarding Claim 7, Arata does not teach the method according to Claim 2 wherein the limited data sinogram, the reprojected sinogram and the augmented limited data sinogram is represented by a data matrix wherein each row represents an angle and each column represents a distance.

Basu et al, in the same field of endeavor for reprojecting a sinogram to a tomographic image, teaches a fast hierarchical backprojection method for imaging wherein the limited data sinogram, the reprojected sinogram and the augmented limited data sinogram is represented by a data matrix wherein each row represents an angle and each column represents a distance (Figures 2 and 3; Column 9, Lines 29-67, Column 10, Lines 1-19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Arata's invention according to the teachings of Basu et al to implement further limitations recited in Claim 7 because it will

Regarding Claim 12, arguments analogous to those presented for Claim 7 applies to Claim 12.

***Allowable Subject Matter***

10. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims

Claim 8 of the instant invention recites the method according to Claim 6 further comprising the steps of comparing the data matrix of the reprojected sinogram is to the data matrix for the limited data sinogram and determining what data is missing from the limited data sinogram.



**Contact Information**

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mehrdad Dastouri whose telephone number is (703) 305-2438. The examiner can normally be reached on Monday to Friday from 8:00 a.m. to 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**MEHRDAD DASTOURI  
PRIMARY EXAMINER**

*Mehrdad Dastouri*

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April 4, 2004